RAILROAD LIVE LOADING AND IMPACT

Railroad loads shall be as provided by applicable current Specifications of the American Railway Engineering Association (AREA), supplemented by this Memo and provisions pertaining to particular railroad companies as provided in Memo 17-120.

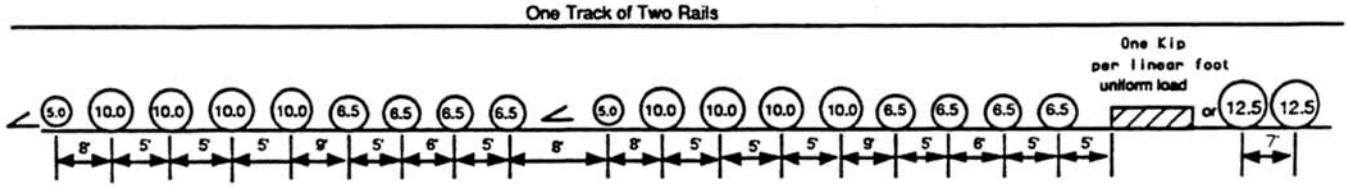
The Cooper's E-10 railroad live loading, illustrated below, can be used for deriving any of the Copper E Loadings. The charts on pages 9-95 and 9-96 in the Bridge Design Aids manual tabulate E-10 moments, shears and reactions. Cooper E-10 values must be multiplied by a factor proportional to the loading being used; e.g., for Cooper's E-72 loading, the factor is 7.2.

Designers should be aware that BDS does not include the uniform load portion of the Cooper E Loadings. The two locomotives with the uniform load may control for negative moment and pier reactions on long span continuous bridges. This loading combination can be investigated by using the H(501) form and input concentrated loads for the two locomotives and a simulated uniform load.

Loads due to the vehicles of modern fixed-rail transit systems have not been standardized for design purposes. They shall be as directed for the specific system under consideration.

CLASS E-10 ENGINE LOADING

One Track of Two Rails



Supersedes Memo to Designers17-130 dated February 1988

IMPACT

The impact load percentage of railroad live loads shall be determined by the following formula according to superstructure type.

1. Simple or continuous span prestressed concrete structures, either cast-in-place post-tensioned or precast-prestressed girders with a reinforced concrete deck:

$$I = 35 - \frac{L^2}{500}$$

where L = span length center-to-center of bearings in feet but does not exceed 60 feet.

$$I = \frac{800}{L-2} + 14$$

but not less than 20%
where L = span length center-to-center of bearings in feet and is greater than 60 feet.

2. Reinforced concrete structures (except for prestressed structures noted below):

$$I = \frac{100LL}{LL + DL}$$

where:

I = The percentage of live load for impact

LL = Total live load on the member for which the computations are being made

DL = Dead load applicable to the member for which the computations are being made

3. Steel Structures: See current AREA specifications.

References:

Southern Pacific Company's letter to J. A. Legarra dated January 20, 1969. Union Pacific Railroad Company's letter to J. A. Legarra dated February 5, 1969. The Atchison, Topeka and Santa Fe Railway Company's letter to J. A. Legarra dated February 10, 1969. The Western Pacific Railroad Company's letter to J. A. Legarra dated March 21, 1969.

When a normally reinforced concrete member supports a member of other materials (e.g., prestressed concrete, steel, etc.) the reinforced concrete member shall be designed using the impact formula for reinforced concrete structures. However, the member of other material being supported shall be designed using impact formulas specified for those materials (eg. prestressed concrete, steel, etc.)

Non-prestressed components of prestressed members shall be designed using the impact formula for reinforced concrete structures, e.g., top slabs in prestressed box girders carrying loads transverse to the direction of prestress or composite decks on prestressed girders carrying loads transverse to the direction of prestress.

FOR
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JGS:jgf